

NASA TECH BRIEF

Lyndon B. Johnson Space Center



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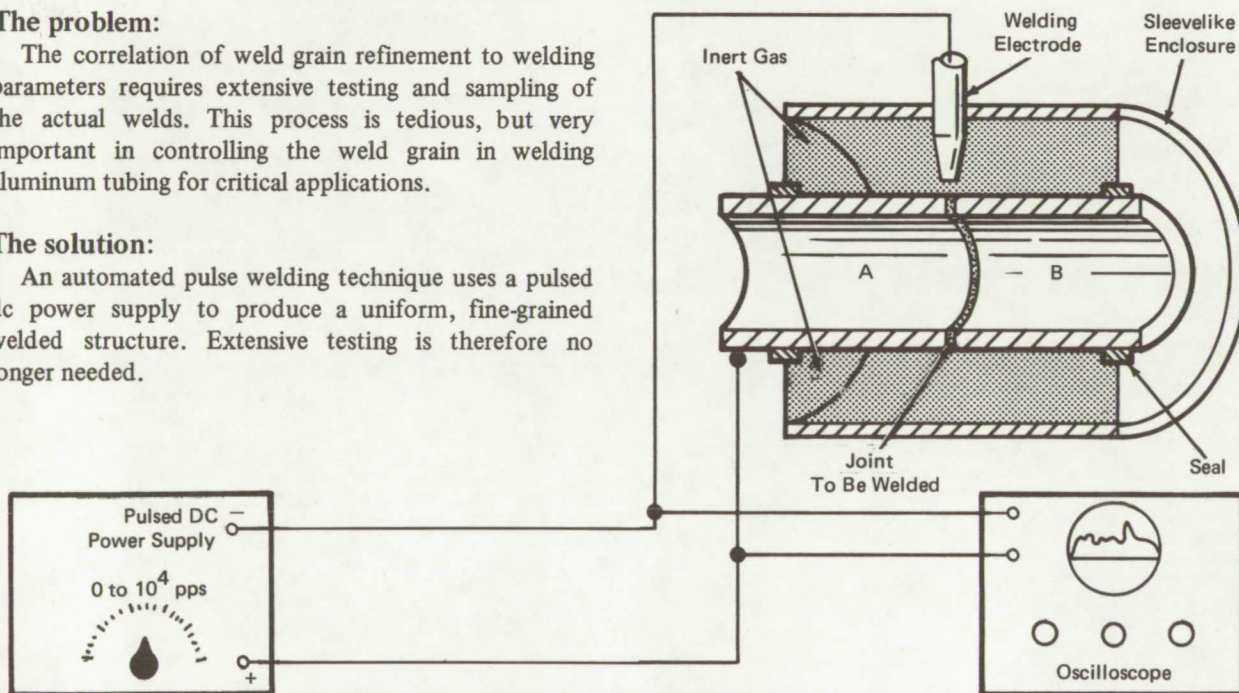
Grain Refinement Control in Gas-Shielded Arc Welding of Aluminum Tubing

The problem:

The correlation of weld grain refinement to welding parameters requires extensive testing and sampling of the actual welds. This process is tedious, but very important in controlling the weld grain in welding aluminum tubing for critical applications.

The solution:

An automated pulse welding technique uses a pulsed dc power supply to produce a uniform, fine-grained welded structure. Extensive testing is therefore no longer needed.



Pulse Arc Welding Apparatus

How it's done:

It is known that the strength of a weld between similar materials is directly related to grain size and the uniformity of the grain structure of the weld. Also, grain size is directly related to the weld puddle agitation present during the welding process. The apparatus used in this new method is shown in the figure. Two tubing sections to be welded, A and B, are enclosed by a sleeve-like enclosure provided at its contacting surfaces with a seal. The enclosure is filled with inert gas.

The welding electrode is fed with a pulsed dc power

supply producing peak currents of 200 amperes. Pulse repetition rate of the supply may be varied from zero to 10^4 pulses per second (pps). The pulse width remains constant as the pulse rate is varied.

When the sections are being welded, the operator varies the pulse rate of the power supply and simultaneously monitors the signal on an oscilloscope until he finds the rate which produces the maximum arc gas voltage. The remainder of the welding is performed with the power supply set at this pulse rate, producing the desired maximum weld puddle agitation and a fine uniform weld of the grain structure.

(continued overleaf)

Note:

Requests for further information may be directed to:
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Patent status:

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning non-exclusive or exclusive license for its commercial development should be addressed to:

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E. L. Whiffen of
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under contract to
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(MSC-19095)